

REMARKS

The Office Action of September 6, 2005 has been received and its contents carefully noted. By this amendment, claim 28 is amended and claim 30 is cancelled without prejudice or disclaimer. Claims 1-27 and 31-35 were previously canceled. Accordingly, claims 28-29 are currently pending in the application, of which claim 28 is an independent claim. Reconsideration and withdrawal of all pending objections and rejections in view of the above amendment and following remarks is respectfully requested.

35 U.S.C. § 103 Rejections

Claims 28 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent No.: JP 63-179977 to Mishima, *et al.* ("Mishima") in view of Japanese Patent No.: JP 06-77483 to Kaneko, *et al.* ("Kaneko"), in view of U.S. Patent No.: 5,354,700 to Huang, *et al.* ("Huang"). This rejection is respectfully traversed.

Claim 30 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,548,828 to Nakanishi, *et al.* ("Nakanishi"), in view of U.S. Patent No. 6,057,896 to Rho, *et al.* ("Rho"), in view of U.S. Pat. No. 5,202,572 to Kobayashi, *et al.* ("Kobayashi"). This rejection is moot in view of the cancellation of claim 30 without prejudice or disclaimer.

With respect to claims 28 and 29, the Examiner alleges that

...it would have been obvious to a person of ordinary skill in the art at the time of invention to form a semiconductor layer with the upper layer having a lower band gap than [sic] the lower layer as taught by Huang et al in the device of Mishima et al. to provide a transistor with high mobility, high transconductance, and excellent hot carrier immunity.

Applicants agree with the Examiner that Mishima generally discloses a conventional TFT structure, that Kaneko generally discloses a double layer of amorphous silicon (3a, 3b), and that Mishima discloses: a) that silicon has a bandgap higher than germanium (Col. 2, lines 22-23) and b) a tri-layer composed of a polysilicon lower layer (35), a silicon-germanium middle layer (36), and a polysilicon upper layer (37) (Figure 2). Applicants respectfully traverse, however, the conclusion that a skilled artisan at the time the invention was made would have been motivated to combine the different silicon and silicon-germanium bandgaps disclosed in Huang in the double-layered amorphous silicon disclosed in Kaneko, and/or to make such a modification in the TFT disclosed in Mishima.

To establish a prima facie case of obviousness, the Examiner must prove that a person of ordinary skill in the art had some motivation to combine the teachings of the cited references, not in a general fashion, but in the exact manner claimed. The motivation may be found in the nature of the problem to be solved, the express

teachings of the prior art, or in the knowledge of one of ordinary skill in the art.

As further explained below, however, the Examiner has failed to provide reasons that the skilled artisan, confronted with the same problem as that contemplated by the inventors and with no knowledge of the claimed invention, would pick the elements from the cited references for combination in the manner claimed. Therefore, the Examiner has proved nor established a prima facie case of obviousness.

For example, claim 28 recites, among other things:

a plurality of pixels defined by gate lines and data lines; and

a plurality of thin film transistors and pixel electrodes formed at the pixel and electrically connected to the gate lines and the data lines,

wherein each of the plurality of the thin film transistors has a semiconductor layer and an ohmic layer, said semiconductor layer having a double-layered structure with a lower layer and an upper layer, each made of amorphous silicon,

wherein the lower layer and the upper layer each have different band gaps.

The combination of Mishima, Kaneko, and Huang fails to disclose these particular claimed features individually or in combination. For example, Mishima discloses a tri-layer structure that includes a lower a-Si:H layer (24), a middle carbon-added hydrogenated amorphous silicon (N+a-SiCH) layer (25) to which N type impurities are added, and an upper ohmic layer (26) formed of either Ti or Cr. (See Abstract). Kaneko discloses a tri-layer that includes a lower layer of high-quality amorphous silicon (3a), a middle layer of lower quality amorphous silicon (3b), an upper

n-type amorphous silicon film layer (7). (See Abstract). Huang discloses a tri-layer that includes a lower layer of polysilicon (35), a middle layer of silicon-germanium (36), and an upper layer of polysilicon (37). Thus, the explicit disclosures of Mishima, Kaneko, and Huang do not, individually or in combination, disclose or suggest the totality of particular features recited in claim 28.

Additionally, there exists no motivation to combine the teachings of Mishima, Kaneko, and Huang as suggested by the Examiner. First, there is no express motivation or suggestion in any of the references to combine any reference with another or with the others.

Second, no motivation to combine exists because each reference is directed to solving a different problem, and each of these different problems are different from the problem(s) to which the features recited in claim 28 are directed to solving. For example, embodiments of the present invention are directed to at least the problems of forming good-quality TFT's using a low temperature process and to improving manufacturing efficiency by forming color filters and TFTs through different manufacturing processes (See specification, page 59). In contrast, Mishima is directed to the problem of obtaining a TFT having "a large operation margin for an Ioff current" (See Abstract); Kaneko is directed to the problem of enhancing TFT operating characteristics while maintaining or increasing a desired throughput (See Abstract); and Huang is directed to avoiding silicon devices that "are limited by a high bandgap E_g of about 1.12 eV which restricts hole mobility and transconductance" (See Col. 1, lines 13-15). Clearly, there is no problem common to several of the references or to the

invention embodied in the features of claim 28 that would have motivated a skilled artisan at the time the invention was made to combine the cited references as suggested by the Examiner.

Additionally, no motivation to combine exists because the teachings of Huang are incompatible with the teachings of Mishima and Kaneko, as well as the features of claim 28. Huang continually refers to polysilicon, which any skilled artisan knows is completely different from the amorphous silicon disclosed in Mishima and Kaneko, as well as recited in claim 28. Due to the completely different atomic structure and operating characteristics of polysilicon and (hydrogenated) amorphous silicon, the skilled artisan would not have been motivated to modify Mishima and Kaneko in view of Huang as suggested by the Examiner.

Moreover, the Examiner cites no specific reasons why the skilled artisan confronted with the teachings of Mishima, Kaneko, and Huang, and without knowledge of the claimed invention, would attempt to implement Huang's teachings of achieving different bandgaps using adjacent layers of polysilicon and polysilicon-germanium in the amorphous silicon layers disclosed in Mishima and Kaneko. For at least these reasons, the Examiner's argument over-generalizes both the features of claim 28 and the disclosures of at least Kaneko and Huang. This generalized argument, unsupported by the reasons mentioned above, makes sense only in view of the Applicants' disclosure, which is classic impermissible hindsight. Accordingly, Applicants submit that claim 28 is allowable over the cited prior art references, whether alone or in combination, and respectfully request that the rejection of independent claims 28-29 be

withdrawn. Claim 29 is allowable over the cited references at least by virtue of its dependency on allowable base claim 28, as well as for its added features.

CONCLUSIONS

Applicants submit that a full and complete response has been made to the pending Office Action and respectfully submit that all of the stated objections and grounds for rejection have been overcome or rendered moot. Accordingly, Applicants respectfully submit that all pending claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is thus respectfully requested to pass the above application to issue.

Should the Examiner feel that there are any issues outstanding after consideration of this Amendment, the Examiner is invited to contact the Applicants' undersigned representative at the number below to expedite prosecution. Prompt and favorable consideration of this Amendment is respectfully requested. Applicants respectfully request that a timely Notice of Allowance be issued for this application.

For the foregoing reasons, the above-identified application, is believed to be in condition for allowance. The Examiner's early and favorable action is respectfully requested.

Respectfully submitted,



Frank Chau
Reg. No. 34,136
Attorney for Applicant(s)

F. Chau & Associates, LLC
130 Woodbury Road
Woodbury, NY 11797
TEL.: (516) 692-8888
FAX: (516) 692-8889